

WHAT IS CLAIMED IS:

1. A method for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle which is running ahead of the vehicle, comprising:
detecting the inter-vehicle distance;
photographing a video image of a vehicular forwarding zone;
detecting a plurality of edges including at least a part of the preceding vehicle from the photographed video image;
detecting an inter-edge spacing of mutually opposing edges from the detected video image; and
calculating a present inter-vehicle distance of the vehicle to the preceding vehicle at a present time point from a previous inter-vehicle distance calculated thereby at a previous time point at which the inter-edge spacing of the mutually opposing edges has previously been detected and the inter-edge spacings at the previous time point and at the present time point.
2. A method for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle which is running ahead of the vehicle, as claimed in claim 1, wherein the mutually opposing edges are one of longitudinally opposing edges with respect to an image screen and laterally opposing edges with respect thereto whose average gray level is larger than the other.
3. A method for estimating an inter-vehicle distance for an automotive vehicle as claimed in claim 1, wherein when detecting the mutually opposing edges on the video image, detecting new edges at an outside of a predetermined

range of a previous video image previously photographed, within the predetermined range of which the mutually opposing edges whose inter-edge spacing is to be detected are present.

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4. A method for estimating an inter-vehicle distance for an automotive vehicle as claimed in claim 1, wherein, when calculating the present inter-vehicle distance, starting a calculation on the present inter-vehicle distance to the preceding vehicle from a time point at which the detected inter-vehicle distance falls within a predetermined range of distance, the predetermined range being modified according to a vehicular running state.

15 5. A method for estimating an inter-vehicle distance for an automotive vehicle as claimed in claim 4, wherein the vehicular running state is a vehicular velocity.

6. A method for estimating an inter-vehicle distance for an automotive vehicle as claimed in claim 1, wherein when detecting the inter-edge spacing of the detected mutually opposing edges, detecting the inter-edge spacing between the mutually opposing edges of one of longitudinally opposing edges or laterally opposing edges detected on the
20 photographed video image whose detected number is less than the other.

7. A method for estimating an inter-vehicle distance for an automotive vehicle as claimed in claim 1, wherein
30 when detecting the inter-edge spacing between the vertical edges detected within the image when the detected inter-vehicle distance is longer than a predetermined distance or the interval of edges detected on the

photographed image are narrower than a predetermined width.

8. A method for estimating an inter-vehicle distance for an automotive vehicle as claimed in claim 1, wherein when detecting the mutually opposing edges and a vehicular velocity is higher than a predetermined vehicular velocity, detecting the inter-edge spacing of the laterally opposing edges detected on the photographed video image.

9. A method for estimating an inter-vehicle distance for an automotive vehicle as claimed in claim 1, wherein when detecting the inter-edge spacing between the mutually opposing edges, detecting laterally opposing edges on the photographed image when the vehicle is turning.

10. A method for estimating an inter-vehicle distance for an automotive vehicle as claimed in claim 1, wherein when detecting the mutually opposing edges, one of the inter-edge spacings of longitudinally opposing edges and horizontally opposing edges whose magnitude is wider than the other is selected.

11. An apparatus for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle which is running ahead of the vehicle, comprising:

an inter-vehicle distance detecting section that detects the inter-vehicle distance;

a photographing device that photographs a video image of a vehicular forwarding zone;

an edge detecting section that detects a plurality of edges including at least a part of the preceding vehicle from the photographed video image by the photographing device and detects an inter-edge spacing of mutually opposing edges

an inter-vehicle distance calculating section that calculates a present inter-vehicle distance from the vehicle to the preceding vehicle at a present time point from a previous inter-vehicle distance calculated thereby at a previous time point at which the inter-edge spacing of the mutually opposing edges has previously been detected and the inter-edge spacings at the previous time point and at the present time point.

13. An apparatus for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle which is running ahead of the vehicle, as claimed in claim 11, wherein the inter-vehicle distance calculating section starts the calculation of the inter-vehicle distance when the inter-vehicle distance detected by the inter-vehicle distance detecting section falls within a predetermined range of distance and comprises a predetermined range modifying section that modifies the predetermined range of distance according to a running state of the vehicle.

14. An apparatus for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle

which is running ahead of the vehicle, as claimed in claim 13, wherein the running state of the vehicle is a vehicular velocity.

5 15. An apparatus for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle which is running ahead of the vehicle, as claimed in claim 11, wherein the edges to be detected by the edge detecting section are one of vertical edges and horizontal edges and
10 wherein the edge detecting section detects the inter-edge spacing of the mutually opposing edges from one of the vertical edges and horizontal edges detected on the video image photographed by the photographing device whose detected number is less than the other.

15 16. An apparatus for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle which is running ahead of the vehicle, as claimed in claim 11, wherein the edges to be detected by the edge detecting
20 section are one of vertical edges and horizontal edges and wherein the edge detecting section comprises a horizontal edge inter-edge spacing detecting section that detects the inter-edge spacing of the horizontal mutually opposing edges detected on the video image photographed by the
25 photographing device when the inter-vehicle distance detected by the inter-vehicle distance detecting section is longer than a predetermined inter-vehicle distance or when the inter-edge spacing between the mutually opposing edges is wider than a predetermined inter-edge spacing.

30 17. An apparatus for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle which is running ahead of the vehicle, as claimed in claim

11, wherein the edges to be detected by the edge detecting section are one of vertical edges and horizontal edges and wherein the edge detecting section detects the inter-edge spacing between the vertically opposing edges when the inter-vehicle distance detected by the inter-vehicle distance detecting section is longer than a predetermined inter-vehicle distance or when the inter-edge spacing between the mutually opposing edges is narrower than a predetermined inter-edge spacing.

18. An apparatus for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle which is running ahead of the vehicle, as claimed in claim 11, wherein the edges to be detected by the edge detecting section are one of vertical edges and horizontal edges and wherein the edge detecting section detects the inter-edge spacing between the horizontally opposing edges detected on the video image photographed by the photographing device when a vehicular velocity of the vehicle is higher than a predetermined vehicular velocity.

19. An apparatus for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle which is running ahead of the vehicle, as claimed in claim 11, wherein the edges to be detected by the edge detecting section are one of vertical edges and horizontal edges and wherein the edge detecting section detects the inter-edge spacing between the horizontally opposing edges detected on the video image photographed by the photographing device when the vehicle is turning.

20. An apparatus for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle

which is running ahead of the vehicle, as claimed in claim 11, wherein the edges to be detected by the edge detecting section are one of vertical edges and horizontal edges and wherein the edge detecting section comprises a selector
 5 that selects one of the inter-edge spacings of the vertical edges which is longer than the other.

21. An apparatus for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle
 10 which is running ahead of the vehicle, as claimed in claim 11, wherein the inter-vehicle distance calculating section outputs the inter-vehicle distance calculated thereby to an adaptive cruise control system.

15 22. An apparatus for estimating an inter-vehicle distance of an automotive vehicle to a preceding vehicle which is running ahead of the vehicle, comprising:
 inter-vehicle distance detecting means for detecting the inter-vehicle distance;

20 photographing means for photographing a video image of a vehicular forwarding zone;

edge detecting means for detecting a plurality of edges including at least a part of the preceding vehicle from the photographed vide image by the photographing means
 25 and for detecting an inter-edge spacing of mutually opposing edges from the detected image; and

inter-vehicle distance calculating means for calculating a present inter-vehicle distance from the vehicle to the preceding vehicle at a present time point
 30 fro a previous inter-vehicle distance calculated thereby at a previous time point at which the inter-edge spacing of the mutually opposing edges has previously been detected and the inter-edge spacings at the previous time point and

at the present time point.

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